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## Guidelines for Explorer Data Management and Data Archiving

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### Purpose of the document

The objective of this document is to provide proposers of Astronomy & Physics or Sun-Earth Connection (SEC) Explorer missions with guidelines on archiving their data. Relevant guidelines for the Stage 1 proposal, for the more detailed Phase A Concept Study Report, and for subsequent mission phases are given.

### Background

Missions have a responsibility to provide data access to the scientists they fund, and to ensure the availability of their data and metadata (calibrations, instrument descriptions, etc.) to the broader science community. The NASA Office of Space Science (OSS) has established an archive infrastructure beyond the scope of individual missions to receive and make these data accessible. Astronomy and Physics data is archived in an ensemble of primarily wavelength-specific astrophysics active archives enumerated in Appendix A. SEC active archives are identified in Appendix B. Where it makes sense scientifically and/or financially, missions may "contract with" multi-mission active archives to help provide data access for mission-funded scientists or, conversely, missions may provide access to their data from their facilities to the broad scientific community. After the completion of the mission all archive activities will be taken over by the relevant multi-mission active archive.

It is expected that data and supporting material in three categories will be provided to the relevant NASA OSS active archive. These are:

1. The best organized/annotated/documented/formatted version of the mission's "not-yet-irreversibly-transformed" data. In some circles these are called Level 1A data. These are further described as "definitive data" at [http://nssdc.gsfc.nasa.gov/nssdc/data\\_retention.html](http://nssdc.gsfc.nasa.gov/nssdc/data_retention.html).
2. Supporting material, including documentation and software when relevant, to enable the long-term correct and independent usability of the data in item 1.
3. Higher level, more immediately usable data products as specified in the Project Data Management Plan (PDMP).

Note that items 1 and 3 might be called "well-documented, raw data" and "well-documented, calibrated data", respectively.

Proposers are encouraged to consult with staff at the relevant NASA active archives early in the process of preparing their initial proposals. They are expected to have such consultations at least in their Phase A work. Proposers are also strongly encouraged to consider using the relevant NASA active archive as their mission archive from which their scientists access data, as this may be the most cost-effective solution for the mission.

## **Guidelines**

### Stage 1 Proposal Activities

The proposal should contain a commitment to creating a PDMP.

Missions should also work at the proposal level with the relevant active archive to at least discuss archival mechanisms, data format standards, data retrieval interfaces, and associated costs. Proposers should also evaluate existing software tools before developing new ones for their mission. Proposals should include cost estimates of data processing and archiving of sufficient detail to be useful in proposal evaluation cycle.

### Phase A Activities

The Concept Study Report must contain a draft PDMP.

This is the time when missions should develop their detailed archive plans. During this phase they will need to interact directly with the relevant archive center.

The archive plan should include the following:

- Data Transfer. Details on data products, supporting material, observation logs, data rates, archive media. This should include the development of metadata descriptions consistent with standard keywords.
- Delivery Schedule. Detailed schedule for data delivery to the archive.

In case missions decide to provide access to their data to the broad scientific community while the mission is active the plan should also include:

- Data Query Tools. Details on search and retrieval interfaces.
- Data Retrieval. Details on data retrieval and distribution, proprietary period, distribution media.
- User Support. Plans for user support activities.

### Activities after Phase A

Every mission should create an initial PDMP within one year after the creation of the mission project office specifying its data management and archiving plans. The PDMP will be revised at least one year before launch and then during the operational phase if deemed necessary. The PDMP will need to be signed off by the Project, the relevant archive, and the HQ Program Scientist.

Pre-launch deliverables to the active archive will include:

- Data model, which will describe the types and quantities of data and supporting material to be archived.
- Data transfer schedule, which will describe the dates, the amount, and the types of data to be transferred to the active archive.

- Mission documentation, including science goals, instrument performance specifications, and instrument and hardware characteristics.

After-launch deliverables will include the data and supporting material.

As missions develop and complete their data products, the archive centers will review and validate them prior to including them among the supported data resources. The mission will be responsible for the content of the science data products served through an archive center, unless the project and the center agree in writing to the contrary. This will assure that NASA data are properly documented and interoperable.

Mission results should be appropriately reported in the literature and every mission should make an effort to compile a list of publications based on that mission's data. Archive users should also be strongly encouraged to provide in their papers a detailed list of identifiers for the data used so that a link can be established between on-line data and the resulting articles.

Transition to a permanent archive at the National Space Science Data Center (NSSDC) will be mediated by the active archive.

## **Appendix A. Astrophysics Archives**

The NASA astrophysics community has organized its data management activities according to wavelength. Microwave data are archived at LAMBDA. Infrared data are archived at IRSA. Near-infrared, optical, and ultraviolet data are managed by MAST. Finally, HEASARC archives high-energy (X-ray and gamma-ray) data, with complementary and collaborating mission-specific data centers (e.g., the Chandra X-ray Center, the SIRTf Science Center, etc.). Furthermore, NED assimilates and merges all multiwavelength data on extragalactic objects into its on-line master directory of galaxies, quasars, and radio sources. NSSDC is the permanent archive for most NASA astrophysics data. Proposers should keep in mind that the archive centers provide focal points for data standards, formats, and technical knowledge specific to the wavelength involved.

### Relevant archive centers:

Legacy Archive for Microwave Background Data Analysis (LAMBDA):

URL To Be Announced

Contact: [Gary.Hinshaw@gsfc.nasa.gov](mailto:Gary.Hinshaw@gsfc.nasa.gov)

Infrared Science Archive (IRSA)

<http://irsa.ipac.caltech.edu/>

Contact: [irsa@ipac.caltech.edu](mailto:irsa@ipac.caltech.edu)

Multimission Archive at the Space Telescope Science Institute (MAST)

<http://archive.stsci.edu/>

Contact: [archive@stsci.edu](mailto:archive@stsci.edu)

High Energy Astrophysics Science Archive Research Center (HEASARC)

<http://heasarc.gsfc.nasa.gov/>

Contact: <http://heasarc.gsfc.nasa.gov/cgi-bin/Feedback>

Chandra X-ray Center (CXC)

<http://asc.harvard.edu/cda/>

Contact: [usupport@cfa.harvard.edu](mailto:usupport@cfa.harvard.edu)

NASA/IPAC Extragalactic Database (NED)

<http://nedwww.ipac.caltech.edu/>

Contact: [ned@ipac.caltech.edu](mailto:ned@ipac.caltech.edu)

National Space Science Data Center (NSSDC)

<http://nssdc.gsfc.nasa.gov/astro/>

Contact: [request@nssdca.gsfc.nasa.gov](mailto:request@nssdca.gsfc.nasa.gov)

## **Appendix B. Sun-Earth Connection Archives**

The Sun-Earth Connection (SEC) active archive environment presently (November 2002) consists of the Sun Earth Connection Active Archive (SEC AA; handling data for most OSS atmospheric/ionospheric, magnetospheric, and cosmic and heliospheric missions) and the Solar Data Analysis Center (SDAC), both located at Goddard Space Flight Center. These are supplemented by other sites, not specifically funded as archive sites, from which various SEC data are made accessible. A prime example is the Advanced Composition Explorer (ACE) Science Center providing public access to ACE data. NSSDC is the permanent archive for NASA's SEC mission data.

National Space Science Data Center (NSSDC)

<http://nssdc.gsfc.nasa.gov/>

Contact: [mcguire@mail630.gsfc.nasa.gov](mailto:mcguire@mail630.gsfc.nasa.gov)

Solar Data Analysis Center (SDAC)

<http://umbra.nascom.nasa.gov/sdac.html>

Contact: [joseph.gurman@gsfc.nasa.gov](mailto:joseph.gurman@gsfc.nasa.gov)

ACE Science Center (ASC)

<http://www.srl.caltech.edu/ACE/ASC/>

Contact: [asc@srl.caltech.edu](mailto:asc@srl.caltech.edu)

RHESSI Science Data Center

<http://rhessidatacenter.ssl.berkeley.edu/>

Contact: [rlin@sunspot.ssl.berkeley.edu](mailto:rlin@sunspot.ssl.berkeley.edu)

TIMED Science Center

<http://www.timed.jhuapl.edu/science/>  
Contact: [Sam.Yee@jhuapl.edu](mailto:Sam.Yee@jhuapl.edu)